

**ON-SITE WASTEWATER MANAGEMENT
IN NEW MEXICO**

**A CASE STUDY OF
PEÑA BLANCA WATER AND SANITATION
DISTRICT**

**Prepared by
Richard P. Rose, Ph.D., P.E., DEE
August 1999**

TABLE OF CONTENTS

	<u>Page</u>
EXECUTIVE SUMMARY	ii
ENVIRONMENT	1
COMMUNITY	1
ON-SITE MANAGEMENT SYSTEM: VISION	3
ON-SITE MANAGEMENT SYSTEM: PLAN	3
ON-SITE MANAGEMENT SYSTEM: IMPLEMENTATION & OPERATION	5
ON-SITE MANAGEMENT SYSTEMS: C2 PROCESS	8
ON-SITE MANAGEMENT SYSTEMS: REVIEW	8
ON-SITE MANAGEMENT SYSTEMS: RE-VISION	8
REFERENCES	9
EXHIBIT A	10
EXHIBIT B	12

EXECUTIVE SUMMARY

In 1985, the community of Peña Blanca, New Mexico was faced with a potential public health problem of growing proportions. The community, located approximately 25 miles southwest of Santa Fe, was experiencing an increasing number of septic tank and cesspool failures resulting in surfacing sewage in many locations. Peña Blanca applied for financial assistance under the Environmental Protection Agency (EPA) Clean Water Grant program and Molzen-Corbin & Associates, Inc. was hired to prepare a facility plan.

Studies conducted under the facility planning process found that 86% of the homes in Peña Blanca needed wastewater disposal system improvements. A number of problems were revealed, including multiple residences served by a common, overloaded, system; systems affected by high groundwater; and inadequate leachfields. The study recommended construction of a small diameter pressure collection system and facultative ponds with intermittent sand filters at an estimated cost of \$3.1 million to solve the problems. This amounted to \$18,300 per connection or \$16,800 per 1,000 gallons of waste treated.

Sufficient funds were not available for the recommended project and a second facility plan was initiated in 1986 to examine the use of on-site wastewater treatment systems. This study found that new septic tank leachfields, cluster systems, and sand mound disposal systems could be installed for an estimated construction cost of \$1.2 million and the project was able to proceed. Between February and September 1990, 133 on-site systems were installed at a total cost of \$939,700.

The Peña Blanca Water and Sanitation District (WSD) was designated as the lead agency for the project because they already provided domestic water service within the project boundary and was charged with the responsibility of maintaining the on-site systems to ensure proper operation. The WSD relies on the New Mexico Environment Department (NMED) to permit on-site wastewater systems and monitor their installation. The WSD provides biannual pumping of the septic tanks for a monthly fee of \$10.64 for a 1,000 gallon tank. The system has been in operation for eight years and recent sampling of private wells in the area found nitrate nitrogen levels below 1 mg/l.

ENVIRONMENT

Peña Blanca is an unincorporated community, located approximately 25 miles southwest of Santa Fe, New Mexico, in Sandoval County. The community is bounded on the south by the Santo Domingo Pueblo Grant and lies within the Pueblo De Cochiti Grant. The community consists of approximately 185 homes and businesses, extends for about two miles along the Rio Grande valley, and is located about one mile east of the river. Cochiti Lake is about five miles to the north. The community sits in an alluvial valley with riparian vegetation typical of the high desert in New Mexico. Perched ground water exists at depths as shallow as five feet. The land has been farmed for centuries and the land use patterns contain the leveled fields and irrigation ditches associated with this activity.

COMMUNITY

The area reflects the rich heritage of the Rio Grande valley with its blend of Pueblo and Spanish cultures. However, the agrarian based economy has kept incomes below State averages. The community is almost entirely rural residential and farming neighborhood, with no industry and only a few commercial service operations. For this project, the community was represented by the Peña Blanca Water and Sanitation District (WSD). The District is organized under New Mexico State Statutes §73-21-1 to 73-21-55 (Water and Sanitation District Act), which requires a petition to the district court signed by at least 25% of the registered voters and an election before a district can be formed. These districts are a subdivision of the State and have the power to levy and collect ad valorem taxes on all taxable property within the district, in addition to the right to issue general obligation and revenue bonds. They also have the right to require property owners within the district to connect to a sewer system in the interest of public health and safety. Prior to this project, the sole function of the Peña Blanca WSD was to provide domestic drinking water to area residents.

Wastewater from households in Peña Blanca had been discharged to septic tanks and cesspools and then to soil dispersal systems. The community recognized a problems with cesspools and inadequate septic tank systems as early as 1977. In 1984, Delta H Engineering, LTD. prepared a generic facility plan for Peña Blanca as part of the process to obtain Federal Environmental Protection Agency (EPA) grant money for wastewater treatment and disposal. The facility plan and an environmental information document were submitted to the New Mexico Environment Department (NMED), formerly the Environmental Improvement Division, in January 1985. The plan considered the following alternatives.

TABLE - 1 — ALTERNATIVE WASTEWATER OPTIONS			
Alternate	Description	Total Construction Cost	Total Present Worth including O&M
CT2	Decentralized collection and on-site treatment	\$370,112	\$315,753
C5+T9A	Small diameter variable grade gravity collection and artificial wetlands treatment	\$403,825	\$346,160
C5+T2A	Small diameter variable grade gravity collection and facultative pond	\$676,849	\$533,365
C5+T6A	Small diameter variable grade gravity collection and centralized on-site treatment	\$669,392	\$539,610
C5+T7A	Small diameter variable grade gravity collection and total retention pond	\$764,267	\$587,347
C1+T1A	Conventional gravity collection and activated sludge treatment	\$664,097	\$717,813
C4+T8A	Small diameter variable grade gravity collection and slow rate land treatment	\$946,731	\$731,859
C3+T6A	Conventional gravity collection and centralized on-site treatment	\$890,977	\$779,827
C1+T6A	Conventional gravity collection and centralized on-site treatment	\$943,270	\$815,090
C5+T5A	Small diameter variable grade gravity collection and controlled discharge pond treatment	\$1,168,038	\$899,605

The recommendation of the report was to install and maintain individual and cluster septic tanks and pipe the effluent to a centralized soil absorption bed (Alternative C5+T6A).

The State review found inadequacies in the plan and disagreed with the finding that Alternative C5+T6A was the most cost effective alternative. The January 18, 1985 comment letter pointed out that Federal Regulations contained in 40 CFR 35.2030 limit EPA financial participation to the most economical means of meeting the applicable effluent, water quality and public health requirements over the design life of the facility. The letter concluded that on-site systems (Alternative CT2) were the most cost effective and financial participation in the project would be limited to the total construction cost of this alternative - \$370,112. If the community wished to proceed with Alternative C5+T6A, it would need to bear the \$299,280 difference in costs.

Another engineer, Molzen-Corbin & Associates, was hired in 1985 to prepare a new facility plan. They chose to pursue the generic facility plan approach outlined in Federal Regulations for small communities with populations less than 10,000. A draft plan was

completed in December 1985 that recommended construction of a small diameter pressure collection system and facultative ponds with intermittent sand filters to collect and treat the wastewater prior to disposal to the Rio Grande. The engineer's estimated cost for this alternative was \$3,111,000. Review of the draft by the State of New Mexico again rejected the proposed alternative stating it was neither feasible nor acceptable. The February 4, 1986 comment letter noted that full project funding was not assured and that the estimated connection cost of \$18,300 per home was three times higher than allowed. When capital cost of treatment per 1000 gallons exceeds \$3,000 the technology may be inappropriate. The estimated capital cost of treatment per 1000 gallons for Peña Blanca was \$16,837. The letter pointed out Federal Regulations, under 40 CFR 35.2030 (a)(1), require that for unsewered portions of communities of 10,000 or less, consideration must be given to on-site systems and suggested that the consultant do a cost-effective analysis on the replacement of those systems which have failed and the purchase of a truck to provide maintenance for all on-site systems. This resulted in a complete revision of the facility plan.

ON-SITE MANAGEMENT SYSTEM: VISION

In September 1986, Molzen-Corbin completed the final wastewater facility plan for Peña Blanca. The report states that after rejection of the facultative pond alternative, rehabilitation of failed systems and construction of new on-site disposal systems were the only alternatives left to the residents of Peña Blanca. Thus, on-site management was a last resort for the community to minimize adverse health effects associated with wastewater disposal after two years of studies and two rejected facility plans. Some of those associated with this project consider it a failure because the community was unable to acquire a collection and treatment system.

ON-SITE MANAGEMENT SYSTEM: PLAN

The final facility plan included an extensive survey of existing on-site disposal facilities to gather information on location, performance, age, drinking water source, winter months water usage, soil conditions, depth to ground water, and any apparent problems. The survey was conducted in May 1986 and found that of the 138 homes, 7 businesses, and 40 trailers in the community, 148 or 80% required new or rehabilitated treatment and/or disposal systems. Forty-six of the homes (33%) used simple cesspools that did not comply with NMED regulations. Eighteen of the systems (10%) were adversely affected by high groundwater. The survey found that very few of the existing systems received any maintenance. Some septic tanks had never been pumped and those that were being pumped, were done so because of problems with their leachfield. Septage from the septic tanks that were pumped, was being dumped at the community's "landfill" that did not meet State solid waste regulations.

Twelve on-site system renovation categories were developed in the facility plan. These are detailed in the following table.

TABLE - 2 — ON-SITE SYSTEM RENOVATION OPTIONS			
TYPE	DESCRIPTION	NUMBER	PERCENT OF TOTAL
1	Install a new septic tank and leachfield due to problems identified in the survey	19	10
1G	Same as Type 1, except a sand mound may be required for the leachfield due to possible high groundwater	7	4
1L	Same as Type 1, except additional land may be required	1	0.5
2	Replace cesspool with septic tank and leachfield	39	21
2G	Same as Type 2, except a sand mound may be required for the leachfield due to possible high groundwater	6	3
2L	Same as Type 2, except additional land may be required	1	0.5
3	Install a new septic tank and leachfield to serve a cluster of homes	23	12.5
4	Install new leachfield system	13	7
4G	Same as Type 4, except a sand mound may be required for the leachfield due to possible high groundwater	5	3
4L	Same as Type 4, except additional land may be required	1	0.5
D	Systems that will be identified or discovered in the detailed design process as having problems	33	18
5	Systems without problems and vacant homes	37	20
TOTALS		185	100

In addition to replacing failed septic tank systems, the final facility plan recommend initiation of a maintenance program. The maintenance program would consist of periodically pumping the septic tanks. Purchase of a septic tank pumping truck was recommended to pump the tanks once every two years. The WSD would keep records of the pumping. The recommendation included construction of a building for office space and to house the pump truck and the construction of a 10 acre septage disposal site on a mesa east of Peña Blanca. The estimated cost for this on-site treatment alternative was \$1,108,084, one third the cost of the collection and treatment alternative. This is consistent with EPA's estimates of potential savings from on-site alternatives contained in their *Response to Congress on use of Decentralized Wastewater Treatment Systems*.

The facility plan included an environmental review as required by the National Environmental Policy Act (NEPA). The review concluded that the proposed project was eligible for a categorical exclusion from further substantive environment review. NMED concurred with the conclusion and by letter dated July 29, 1986 requested EPA to grant the categorical exclusion. EPA agreed and issued a categorical exclusion on August 29, 1986 based on the following conditions pursuant to 40 CFR 6.505(b) and (c).

- 1) It involved an "unsewered community with a population of less than 10,000 persons where onsite technologies are proposed."

- 2) Is “solely directed toward a minor rehabilitation of existing facilities.”
- 3) Will “functionally replace equipment.”
- 4) Will not “create a new discharge to surface or groundwaters.”
- 5) Will not “provide capacity to serve a population 30 percent greater than the existing population.”
- 6) Is not “known or expected to have significant effect on the quality of the human environment, either individually, cumulatively over time, or in conjunction with other federal, State, local or private actions.”
- 7) Is not “known or expected to directly or indirectly affect sensitive environmental resources or areas, such as floodplains, wetlands, important farmlands, aquifer recharge zones, archeological and historic sites, habitats of endangered or threatened species, or any other resource areas identified in supplemental guidance issued by the OFA (EPA’s Office of Federal Activities).”
- 8) Is not “known or expected not to be cost-effective or cause significant public controversy.”

After a thirty day comment period, the categorical exclusion was finalized by EPA in a letter dated September 12, 1986.

ON-SITE MANAGEMENT SYSTEM: IMPLEMENTATION & OPERATION

The final facility plan was accepted by the State NMED and Molzen-Corbin began design and preparation of plans and specifications. The engineering contract for this work included \$31,525 for Basic Services, \$1,200 to prepare a Plan of Operation, \$4,500 to prepare a sewer use ordinance and user charge system, \$14,570 to prepare the operation and maintenance (O&M) manual, \$6,860 to prepare project performance reports, \$3,430 for start-up services, and \$55,260 for a resident project representative for field observations during construction. The total contract value was \$117,345. In addition to the design work, the engineer was responsible for obtaining all the easements necessary for construction. Four different types of easements were required as summarized in the following table.

TABLE - 3 — ON-SITE EASEMENTS REQUIRED FOR CONSTRUCTION	
TYPE OF EASEMENT	NUMBER REQUIRED
Standard Easement Agreement - for most of the properties, it includes permission to perform work, access for construction, access for maintenance, and payment of monthly fees.	134
No Work Easement Agreement - for those properties that required no modifications to existing systems, it included access for maintenance and payment of monthly fees.	26
Neighboring Disposal System - for those properties where cluster systems were installed to serve multiple residences, it includes all the elements in the Standard Easement Agreement plus an easement for disposal systems to serve adjacent homes.	17

Mound System Easement - for those properties with shallow ground water that required mound disposal systems, it includes an easement for the utility company to bring electrical service to the pump.	11
--	----

Successfully concluding the negotiations for these easements was a major accomplishment and essential to completion of the project. Drawings were prepared for each installation which included one or more houses. Detail drawings were prepared for each of the standard wastewater systems - septic tank, sand mound, and disposal trenches. Drawings were also prepared for the administration building to house the WSD. A full set of specifications were prepared for the wastewater installation and administration building. The contract documents contained 135 bid items, one lump sum price for each installation. The specifications were advertised for bid on October 19, 1989 and opened on November 22, 1989. Four bids were received, with the lowest bid from Albuquerque Underground, Inc. in the amount of \$865,638.26.

NMED approved award of the construction contract on January 18, 1990 and the preconstruction conference was held on February 2, 1990. A total of \$759,820 of the \$865,638.26 construction contract was eligible for EPA grant funding. Construction was to be completed within 180 days of the notice to proceed. A total of 133 on-site systems were constructed - septic tank and leachfields, sand mound systems with lift stations, and distribution bed systems. The original construction budget was \$841,600, the final construction contract cost, with change orders, was \$939,700. Construction was completed between February 1990 and September 1990. Construction was complicated by the need to work around existing homes and utilities and limit the disruption to daily life. In some cases, the contractor built dirt ramps to get construction equipment over block walls where gates were not wide enough for access. Boom trucks were needed to lift septic tanks over houses and place them in backyards. Hand excavation was required in many locations. However, even with these difficulties, no substantial delays were experienced and the project was completed within one month of the originally scheduled time.

After construction was complete, Peña Blanca WSD took over operation of the wastewater treatment system. The function of the WSD is limited to collection of monthly user fees, contracting for septic tank pumping services, and scheduling and coordinating biannual pumping. The original idea to purchase a pumper truck and construct a septage disposal facility were abandoned in favor of contracting pumping services and negotiating an agreement with the City of Albuquerque to accept the septage at their wastewater treatment plant.

The WSD has assumed no responsibility for permitting the installation of new on-site wastewater systems or for the compliance of existing systems. This responsibility resides with the District 1 office of NMED. Only one county in New Mexico has an environment health department that permits septic tank systems (Bernalillo County). The permitting of systems in the remainder of the State is done by four NMED District offices in compliance with the State Liquid Waste Regulations. The WSD has acted as the eyes and ears of the District office, making sure new installations are permitted and calling to the attention of the District offices systems that show signs of trouble or failure.

The on-site management system is run in accordance with the O&M manual prepared by Molzen-Corbin. The table of contents is attached as Exhibit A. The manual addresses such items as management's responsibilities, user fees, septic system maintenance, septage pumping, and care of pumps. A "Permit for Sewage Disposal" is required for all new installations. Conditions include a permit from NMED, signed easement for access for maintenance, and a copy of the property deed. A "Home Owners Briefing Information" sheet is provided to each home owner, explaining operation and maintenance of septic tanks. The WSD is responsible for maintaining records of maintenance of individual systems and records of pumping. Actual maintenance of items such as pumps, is performed by a contractor to the WSD.

An "Ordinance Governing the Wastewater and Sewage Disposal Systems within the District" was drafted by Molzen-Corbin and adopted by the WSD. This sewer use ordinance prohibits untreated and unauthorized discharges and sets criteria for wastewater systems within the district. The ordinance lists substances that may not be discharged into wastewater systems, such as pesticides and heavy metals, and provides for sampling and testing. It also enacts procedures for operation, maintenance, and repair of private sewage disposal systems. Penalties for violation of the user ordinance were established that include a fine up to \$300 and imprisonment of not more than 90 days. Remedies for non-payment of bills includes a provision for a lien on the property. A general provision for access to private property for inspection, construction, maintenance, and operation is included in the ordinance. The ordinance is considered a part of the contract with every person utilizing a private sewage disposal system.

The ordinance establishes a methodology for determining user fees, where the monthly fee is the sum of the apportioned operating costs plus a volume adjusted maintenance cost. An analysis of system costs was performed to justify the initial user fees. The total projected annual budget was \$15,610; \$7,785 for personnel, utilities, supplies, and insurance and \$7,825 for system repairs, capital reserve, and the contract with a septage hauler. Two categories of users were identified in the WSD, those that receive routine operation and maintenance services and those that do not (designated as "stand-by"). At the start, a total of 190 accounts existed, including 20 stand-by. The base fee was determined to be \$3.30 per month (\$7,785 divided by 190, divided by 12 months). This fee is charged to all 190 accounts within the WSD. Those systems receiving routine maintenance pay an additional charge based upon the size of their septic tank. This reflects the charge to the WSD for pumping, which is also based upon the size of the septic tank. The proportion is based upon the total volume of septic tanks in the district, with a 750 gallon minimum tank size. The adjusted charge for a 1000 gallon tank was \$6.16 for a total month fee of \$9.46. Currently the Peña Blanca WSD has a total of 208 accounts, 55 are stand-by. In 1998 the user fees were increased approximately 12.5% to meet increased costs. The base rate was raised to \$4.07 per month and the additional maintenance charge for a 1000 gallon tank was raised to \$6.57, for a total monthly fee of \$10.64.

ON-SITE MANAGEMENT SYSTEMS: C2 PROCESS (CHECKING AND CORRECTIVE ACTION)

Peña Blanca WSD has not monitored or tracked performance of on-site systems or the management program. No formal process is in place for this purpose. The WSD has made corrections to improve operations as problems were discovered. As an example, the original construction did not include adequate markers to locate the septic tanks for pumping. These were added as pumping progressed.

NMED did collect water samples from 16 private wells in the area in 1998 for its own follow up. It found near background levels of nitrates in all samples, with only one sample exceeding 1.0 mg/l. The results are contained in a graph in Exhibit B.

ON-SITE MANAGEMENT SYSTEMS: REVIEW

Peña Blanca WSD has no formal process to review the management system, but does make changes as circumstances warrant. In 1998 the WSD reviewed user fees and enacted a 12.5% rate increase, the first one since inception, raising pumping fees from \$9.46 to \$10.64 per month for a 1000 gallon septic tank. The rate increase was necessitated by increase costs to the WSD over the eight year operating period since rates were first established.

ON-SITE MANAGEMENT SYSTEMS: RE-VISION

Peña Blanca WSD never developed a vision for on-site management and has no process to create one or revisit it.

REFERENCES

- 1) Delta H Engineering, LTD, *Generic Wastewater Facility Plan, Prepared for Peña Blanca Water and Sanitation District*, January 9, 1984.
- 2) Delta H Engineering, LTD, *Generic Wastewater Facility Plan - Environmental Information Document, Prepared for Peña Blanca Water and Sanitation District*, January 9, 1985.
- 3) Environmental Protection Agency, *Letter transmitting August 29, 1986 Issuance of a Categorical Exclusion to the Peña Blanca Water and Sanitation District*, September 12, 1986.
- 4) Environmental Protection Agency. *Response to Congress on use of Decentralized Wastewater Treatment Systems*. Office of Water. April 1997.
- 5) Molzen-Corbin & Associates, *Peña Blanca Water and Sanitation District, Final Wastewater Facility Plan*, September 1986.
- 6) Molzen-Corbin & Associates, *Peña Blanca Water and Sanitation District Operation and Maintenance Manual*, August 1990.
- 7) Molzen-Corbin & Associates, *Project Manual for Wastewater Treatment Facilities, Peña Blanca Water and Sanitation District*, January 1990.
- 8) National Onsite Demonstration Program, *Case Study Guidelines*, May 1999.
- 9) New Mexico Environment Department, *Comment Letter on the Draft Generic Facilities Plan for PBW&SD*, January 18, 1985.
- 10) New Mexico Environment Department, *Comment Letter on the Facilities Plan for Wastewater Project C-35-1083, Peña Blanca W&SD*, February 4, 1986.
- 11) New Mexico Environment Department, *Letter to EPA Region VI requesting Categorical Exclusion for Peña Blanca Wastewater Project C-35-1083*, July 29, 1986.

**EXHIBIT A -
PEÑA BLANCA WSD OPERATION AND MAINTENANCE MANUAL
TABLE OF CONTENTS**

SECTION 1 - INTRODUCTION

- 1.0 Guide to Manual Format

SECTION 2 - GENERAL OPERATIONS

- 2.0 Management's Responsibilities

SECTION 3 - REFERENCE DRAWINGS

- 3.1 Construction Drawings
- 3.2 System Location & Identification

SECTION 4 - SYSTEM/OWNER FILES

- 4.0 General
- 4.1 User Fees
- 4.2 Delinquent Accounts

SECTION 5 - LIST OF SYSTEMS

- 5.0 General
- 5.1 Numeric Listing
- 5.2 Alphabetical Listing

SECTION 6 - PROCEDURES FOR NEW SYSTEMS

- 6.1 Application and Permit

SECTION 7 - SEPTIC TANK SYSTEM

- 7.0 General Description
- 7.1 Home Owners' Responsibilities
- 7.2 Maintenance Requirements
- 7.3 Emergency Conditions

SECTION 8 - PUMPS

- 8.0 General
- 8.1 Plumbing Contractor

SECTION 9 - SEPTAGE PUMPING & HAULING

- 9.0 General Bid Package
- 9.1 Pumping Schedule List
- 9.2 Record Keeping
- 9.3 Septic Tank Pumping

SECTION 10 - DISTRICT OFFICE OPERATION & MAINTENANCE

- 10.1 District Office Building
- 10.2 Maintenance

SECTION 11 - SAFETY

- 11.0 General

SECTION 12 - APPENDIX

- 12.1 Appendix 1 Record Keeping Form Originals
- 12.2 Appendix 2 Sewage Pumping Contractors Bid Package
- 12.3 Appendix 3 Intermunicipal Agreement
- 12.4 Appendix 4 Sewer Use Ordinance
- 12.5 Appendix 5 User Fees & User Rate Ordinance
- 12.6 Appendix 6 Pump Manufacturer's Operation & Maintenance Manual
- 12.7 Appendix 7 Building Equipment Manufacturer's Operation & Maintenance Manuals
- 12.8 Appendix 8 Equipment Suppliers List
- 12.9 Appendix 9 Reference Drawings

LIST OF TABLES

OPERATIONS CHECKLIST/SCHEDULE
SYSTEM/OWNER BILLING FORM
NUMERIC SYSTEM INDEX
ALPHABETIC SYSTEM INDEX
NEW SYSTEM APPLICATION PROCEDURE
PERMIT FOR SEWAGE DISPOSAL
HOME OWNERS BRIEFING INFORMATION SHEET
WORK ORDER/COMPLAINT FORM
PUMPING CONTRACTOR'S CHECKLIST

LIST OF FIGURES

District Map Index
Vicinity Map 1
Vicinity Map 2
Vicinity Map 3
Septic Tank Schematic
Leach Field Schematic
Mound Drain Field
Septic Tank Inspection
Water & Sanitation District Office

EXHIBIT B